

WHAT IS CLAIMED IS:

1. A device for treating a tissue in an individual comprising:

5 an applicator,

a means to drive said applicator, and

an abrasive material.

2. The device of claim 1, further comprising a

10 housing means.

3. The device of claim 1, wherein said tissue is altered

or at least a portion of said tissue is ablated.

15 4. The device of claim 1, wherein said tissue is

membranous or non-membranous.

5. The device of claim 4, wherein said membranous

tissue is the stratum corneum.

6. The device of claim 5, wherein said non-membranous tissue is bone.

7. The device of claim 1, wherein said applicator
5 comprises a rough-textured surface disposed adjacent said tissue or
an actuator in contact with said tissue.

8. The device of claim 1, wherein said driving means
is a piezoelectric material, a solenoid, a pressurized gas, an
10 explosive discharge, a voice-coil, an electro- or magneto-responsive
material, or an electro- or magneto-rheologic material, or a shape-memory alloy or polymer.

9. The device of claim 8, wherein said electro- or
15 magneto-responsive material is polypyrrol.

10. The device of claim 8, wherein said electro-rheologic material is metallic filings dispersed in a viscous fluid.

20 11. The device of claim 8, wherein said magneto-rheologic material is magnetic filings dispersed in a viscous fluid.

12. The device of claim 8, wherein said shape-memory alloy is Nitonol.

5 13. The device of claim 8, wherein said driving means further comprises an electrophoretic means, mechanical pressure, osmotic pressure, hydrostatic pressure or a diffusion gradient.

10 14. The device of claim 1, wherein said abrasive material is biologically inert particles.

15 15. The device of claim 14, wherein said abrasive has a particle size of about 30 microns to about 120 microns.

15 16. The device of claim 15, wherein said abrasive has a particle size of about 50 microns to about 90 microns.

17. The device of claim 14, wherein said abrasive is diamond, aluminum oxide, carborundum, or ice.

18. The device of claim 1, wherein said abrasive further comprises a lubricant.

19. The device of claim 18, wherein said lubricant is
5 water, a hydrogel, a lipid, aqueous carbohydrate, petrolatum, or glycerol or a combination thereof.

20. The device of claim 1, further comprising a means to deliver a pharmaceutical.

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21. The device of claim 20, wherein said pharmaceutical is an anesthetic, nitroglycerin, an anti-nauseant, an antibiotic, a hormone, a steroidal antinflammatory agent, a non-steroid antiinflammatory agent, a chemotherapeutic agent, an anti-
15 cancer agent, an immunogen, an anti-viral agent or an anti-fungal agent, or a diagnostic material.

22. The device of claim 21, wherein said antibiotic is tetracycline, streptomycin, sulfa drugs, kanamycin, neomycin,
20 penicillin, or chloramphenicol.

23. The device of claim 21, wherein said hormone is parathyroid hormone, growth hormone, gonadotropins, insulin, ACTH, somatostatin, prolactin, placental lactogen, melanocyte stimulating hormone, thyrotropin, parathyroid hormone, calcitonin, 5 enkephalin, or angiotensin.

24. The device of claim 21, wherein said anesthetic is lidocaine, bupivocaine, tetracaine, morphine, or fentanyl.

10 25. The device of claim 21, wherein said immunogen is a vaccine.

26. The device of claim 20, wherein said delivery means is said abrasive, wherein said abrasive is said pharmaceutical 15 or said abrasive further comprises a lubricant containing said pharmaceutical.

27. The device of claim 26, wherein said pharmaceutical is a crystallized pharmaceutical or a powdered 20 pharmaceutical

28. The device of claim 27, wherein said crystals are frozen.

29. The device of claim 20, wherein said delivery
5 means comprises:

a reservoir containing said pharmaceutical, and
a permeable membrane through which said pharmaceutical is controllably released.

10 30. The device of claim 1, further comprising a collection means to collect ablated tissue or a biomolecule after treating said tissue at a site of interest.

15 31. The device of claim 30, wherein said collection means is a container operably connected to said device or an absorptive medium.

32. The device of claim 31, wherein said absorptive medium is activated carbon, a dehydrated hydrogel or cotton.

33. The device of claim 1, wherein said device is contained within a patch or said device is positioned on a probe, said probe insertable into a body cavity.

5 34. The device of claim 1, further comprising a control means to monitor feedback about an electrical property of said tissue, said control means comprising:

 at least one first active electrode in electrical contact at a site of interest on said tissue;

10 a second return electrode in electrical contact distal to said first electrode at the site of interest;

 an optional electrically conductive fluid interface between said first and second electrodes and the site of interest on said tissue; and

15 a controller to monitor an electrical current between said first electrode and said second electrode, said controller further comprising a microprocessor.

20 35. The device of claim 34, wherein said first electrode(s) and said second electrode and an electrolyte in body fluid in said tissue comprise a galvanic cell.

36. The device of claim 34, wherein said property is electrical impedance, electrical conductance, hydration, pH, or an endogenous electrical signal.

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37. The device of claim 36, wherein said endogenous electrical signal is generated by a heartbeat or by brain activity of the individual.

10 38. A method to control the permeability of a tissue in an individual comprising the steps of:

 contacting a site of interest on said tissue with the device of claim 34;

15 treating said tissue to ablate or alter said tissue at the site of interest;

 monitoring an electrical property of said tissue at the site of interest;

 applying an algorithm to evaluate said electrical property;

comparing the value obtained for said electrical property to a predetermined value wherein said values correlate to the permeability of said tissue; and

determining if said obtained value is at least equal to

5 said predetermined value; and

signaling said device via said controller to continue said ablating or said altering if said obtained value does not at least equal said predetermined value thereby controlling the permeability of said tissue at the site of interest.

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39. The method of claim 38 further comprising the step of delivering a pharmaceutical to the site of interest wherein said pharmaceutical is delivered during said monitoring step or subsequent to reaching said predetermined value of said physical

15 property.

40. The method of claim 38 further comprising the step of collecting a biomolecule through said altered or ablated tissue when said predetermined value of permeability is reached.

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41. The method of claim 38, wherein said predetermined value of said physical property is a known value or is obtained prior to treating said tissue.

5 42. The method of claim 41, wherein said predetermined value of said physical property is obtained from the same individual or within a group of individuals.

10 43. The device of claim 1, further comprising a control means to monitor feedback about an optical property of said tissue, said control means comprising:

15 at least one source of radiant energy directed at a site of interest on said tissue;

20 a light detector having optics with which to image said tissue thereon; and

25 a controller to monitor the radiant energy source and the light detector and to analyze data received from the light detector, said controller further comprising a microprocessor.

30 44. The device of claim 43, wherein said optical property is fluorescence or reflectance.

45. A method to control the permeability of a tissue in an individual comprising the steps of:

contacting a site of interest on said tissue with the device
5 of claim 43;

treating said tissue to ablate or alter said tissue at the site of interest;

monitoring an optical property of said tissue at the site of interest;

10 applying an algorithm to evaluate said optical property;

comparing the value obtained for said optical property to a predetermined value wherein said values correlate to the permeability of said tissue; and

determining if said obtained value is at least equal to
15 said predetermined value; and

signaling said device via said controller to continue said ablating or said altering if said obtained value does not at least equal said predetermined value thereby controlling the permeability of said tissue at the site of interest.

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46. The method of claim 45 further comprising the
step of delivering a pharmaceutical to the site of interest wherein
said pharmaceutical is delivered during said monitoring step or
subsequent to reaching said predetermined value of said physical
5 property.

47. The method of claim 45 further comprising the
step of collecting a biomolecule through said altered or ablated
tissue when said predetermined value of permeability is reached.

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48. The method of claim 45, wherein said
predetermined value of said physical property is a known value or is
obtained prior to treating said tissue.

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49. The method of claim 48, wherein said
predetermined value of said physical property is obtained from the
same individual or within a group of individuals.

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50. The device of claim 1, further comprising a control
means to monitor feedback about a thermal property of said tissue,
said control means comprising:

at least one source of infrared energy directed at a site of interest on said tissue;

an infrared detector having optics with which to measure infrared emission from said tissue thereon; and

5 a controller to monitor the infrared energy source and the infrared detector and to analyze data received from the light detector, said controller further comprising a microprocessor.

51. The device of claim 50, wherein said thermal
10 property is thermal diffusivity and thermal conductivity.

52. A method to control the permeability of a tissue in an individual comprising the steps of:

15 contacting a site of interest on said tissue with the device of claim 50;

treating said tissue to ablate or alter said tissue at the site of interest;

monitoring a thermal property of said tissue at the site of interest;

20 applying an algorithm to evaluate said thermal property;

comparing the value obtained for said thermal property to a predetermined value wherein said values correlate to the permeability of said tissue; and

determining if said obtained value is at least equal to

5 said predetermined value; and

signaling said device via said controller to continue said ablating or said altering if said obtained value does not at least equal said predetermined value thereby controlling the permeability of said tissue at the site of interest.

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53. The method of claim 52 further comprising the step of delivering a pharmaceutical to the site of interest wherein said pharmaceutical is delivered during said monitoring step or subsequent to reaching said predetermined value of said physical
15 property.

54. The method of claim 52 further comprising the step of collecting a biomolecule through said altered or ablated tissue when said predetermined value of permeability is reached.

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55. The method of claim 52, wherein said predetermined value of said physical property is a known value or is obtained prior to treating said tissue.

5 56. The method of claim 55, wherein said predetermined value of said physical property is obtained from the same individual or within a group of individuals.

10 57. A method of treating a tissue in an individual comprising the steps of:

15 contacting said tissue in the individual at a site of interest with the device of claim 1; and

20 altering or ablating said tissue or a combination thereof at said site of interest with said device.

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58. The method of claim 57 further comprising the step of delivering a pharmaceutical to said site of interest wherein said pharmaceutical is delivered simultaneously during said altering step or subsequent to said altering step.

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59. A method for collecting a biomolecule from a tissue in an individual comprising the steps of:

contacting said tissue in the individual at a site of interest with the device of claim 1;

5 altering or ablating said tissue at the site of interest; and

collecting said biomolecule through said altered or ablated tissue at the site of interest wherein said biomolecule is collected in a container operably connected to said device.

10 60. A device for ablating tissue of an individual comprising:

an applicator,

a transducer to drive said applicator, and

an abrasive material comprised of particles of aluminum

15 oxide, said particles having a particle size of about 30 microns to about 120 microns.

61. The device of claim 60, further comprising a lubricant of glycerol and water.

62. The device of claim 61, wherein said lubricant is electrically conductive.

63. A method of ablating tissue from an individual
5 comprising the steps of:

contacting the tissue in the individual at a site of interest
with the device of claim 60; and
ablating the tissue at the site of interest.

10 64. The method of claim 63 further comprising the
step of delivering a pharmaceutical to the site of interest wherein
said pharmaceutical is delivered simultaneously during said ablating
step or subsequent to said ablating step.

15 65. A method for collecting a biomolecule from a
tissue in an individual comprising the steps of:

contacting the tissue of the individual at a site of interest
with the device of claim 60;
ablating said tissue at the site of interest; and

collecting said biomolecule from said tissue through said ablated tissue at the site of interest wherein said biomolecule is collected in a container operably connected to said device.

5 66. A device for ablating tissue of an individual

comprising:

an actuator,

a transducer to drive said actuator;

a controller to control said transducer; and

10 a housing means further comprising two wheels rotatably attached thereto.

67. The device of claim 66, wherein said actuator is a piezoelectric actuator.

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68. The device of claim 66, wherein said tissue is stratum corneum.

20 69. A method of ablating tissue from an individual comprising the steps of:

contacting said tissue in the individual at a site of interest with the device of claim 66;

applying downward pressure on the device to upwardly direct said tissue at the site of interest into said housing, said tissue

5 in contact with the actuator; and

ablating said tissue at the site of interest via said actuator.